Aquatic Invertebrate Survey of the Dauphin Lake, Manitoba Drainage Basin, 1982

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May 1987

Canadian Data Report of Fisheries and Aquatic Sciences No. 625

87-05241/

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Fisheries and Aquatic Sciences 625

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by

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This is the 7th Data Report
from the Central and Arctic Region, Winnipeg

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Cat. No. Fs 97-13/625 ISSN 0706-6465

Correct citation for this publication is:

Cobb, D.G., and J.F. Flannagan. 1987. Aquatic invertebrate survey of the Dauphin Lake, Manitoba Drainage Basin, 1982. Can. Data Rep. Fish. Aquat. Sci. 625: iv + 16 p.

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ABSTRACT

Cobb, D.G., and J.F. Flannagan. 1987. Aquatic Invertebrate Survey of the Dauphin Lake, Manitoba Drainage Basin, 1982. Can. Data Rep. Fish. Aquat. Sci. 625: iv + 16 p.

An aquatic invertebrate baseline survey of the major rivers entering Dauphin Lake, Manitoba was conducted in 1982. Descriptions of sample stations, results of physical/chemical data, and seasonal densities of aquatic invertebrate orders are tabulated.

Key words: rivers; aquatic invertebrates; Ekman dredge; surber; nutrients elements.

RÉSUMÉ

Cobb, D.G., and J.F. Flannagan. 1987. Aquatic invertebrate survey of the Dauphin Lake, Manitoba Drainage Basin, 1982. Can. Data Rep. Fish. Aquat. Sci. 625: iv + 16 p.

Une étude de base des invertébrés aquatiques des principales rivières qui se jettent dans le lac Dauphin, au Manitoba, a été effectuée en 1982. On y présente les postes d'échantillonnage, les résultats des données physiques et chimiques et les densités saisonnières des ordres d'invertébrés aquatiques sous forme de tableaux.

Mots-clés: rivières; invertébrés aquatiques; benne preneuse Ekman; Surber; éléments nutritifs; éléments.

INTRODUCTION

In 1982, an aquatic invertebrate survey was conducted in the Dauphin Lake, Manitoba drainage basin. This study, part of a larger research program by the Canada Department of Fisheries and Oceans to study techniques for the rehabilitation of declining Canadian fisheries is a co-operative pilot project with the Manitoba Department of Natural Resources. The walleye Stizostedion vitreum vitreum (Mitchill) fishery on Dauphin Lake, is the focus of the present program (Flannagan et al., unpublished). This fishery is valuable both commercially and for sport and information gained from this pilot study can be applied to fisheries on large lakes, eg. Lake Winnipeg.

Increased agricultural development in the last 50 years has led to extensive ditching, channelization and land clearing, all of which contributed to changes in the aquatic ecosystem in the form of increased siltation, substrate instability, and higher peak discharges in the spring (Hill 1980; Dance and Hynes 1980). Lack of reproductive success of walleye in the Valley River, a tributary of Dauphin Lake, has been attributed to physical disturbances such as sedimentation and changes in intensity and duration of spring run-off (Gaboury 1985). The purpose of the 1982 stream survey was to identify species of aquatic invertebrates which by their presence, absence or abundance could be used as indicators of poor habitat (pollutants, sedimentation, substrate instability, etc.). Presence or absence of these indicator species in rivers flowing into Dauphin Lake that are used by spawning walleye could then be used to provide possible reasons for poor spawning success of the walleye. The baseline survey would also provide a reference point for future stream rehabilitation studies.

This report presents the physical/chemical data collected in the 1982 survey and presents data on the densities and distribution of orders of aquatic invertebrates occurring in the Dauphin Lake drainage basin. Further analysis of selected orders at the species level will appear in another report.

METHODS

DESCRIPTION OF THE STUDY AREA

Dauphin Lake, situated in west-central Manitoba (51°17'N, 99°48'W) is a remnant of glacial Lake Agassiz. Babaluk et al. (1984) provide descriptions of the lake and its fishery. The drainage basin of the lake (Fig. 1) with an area of 8700 km^2 consists of seven permanent rivers originating in the Duck Mountain Provincial Park to the north-west and the Riding Mountain National Park to the south and southwest. These "mountains" are actually part of the Manitoba escarpment marking a former border of glacial Lake Agassiz. Numerous other small creeks and ditches in the Dauphin Lake drainage basin flow intermittently during and shortly after spring thaw.

Table 1 provides a description of the major rivers in the drainage basin. More detailed descriptions of the drainage basin are found in Cobb and Flannagan (personal communication).

FIELD SAMPLING PROCEDURES

Three stations were sampled on each of the seven rivers (Fig. 1). "Mouth" stations were situated approximately 100 M upstream from the lake. The "downstream riffle" stations were situated as close to the lake as possible, upstream from the influence of seiches from the lake. The "upstream riffle" stations were located as far from the lake as possible but before the rivers branched into lower ordered streams arising in the Parks. These upstream stations were above any major anthropogenic perturbations associated with agricultural development (land clearing, channelization, etc.) known to influence stream biota.

Mouth and riffle stations were visited monthly from May to August and May to September, 1982 respectively. On each sampling date, three replicate, random samples were taken. At the mouth stations, a tall FRB Birge-Ekman grab (Burton and Flannagan 1973) (0.0225 m^{-2}) with an automatic release closing mechanism (Burton 1974) was used and samples were sieved through a 200 µm mesh. At the riffle stations a Surber sampler (0.0929 m^{-2}) with a 200 µm mesh was used. All samples were preserved in 10% formalin, later washed, sorted to taxonomic order and stored in 70% ethanol. Specimens of Trichoptera, Ephemeroptera and Plecoptera were sorted to lowest taxonomic level for later analysis.

On each sampling date, air and water temperature were recorded (hand held thermometer), and water samples were taken for same-day laboratory analysis of: pH (Radiometer pH meter model #29 pH), conductivity (Radiometer conductivity meter, model #CDM 2C), and dissolved oxygen (Winkler titration method). At the mouth stations, depth, turbidity (loss of light at 10 cm) and type of substrate were recorded. At each riffle station velocity (Ott current meter) was measured and substrate type was characterized.

Additional data (discharge, total suspended solids) were obtained from the sediment data report given in Canadian Rivers 1982 (Environment Canada 1984). Stream order and approximate drainage area above each station were determined using planimetry on a 1:50000 scale topographic map.

DATA PRESENTATION

The physical/chemical data are reported in Tables 2 and 3, and analysis for major nutrients and elements from before and after spring run-off are presented in Tables 4 and 5. In addition to the discharge and total suspended solids (tss) which were measured at sample times (Table 3), Fig. 2-5 present the spring peak of

discharge and tss, to give an indication of the magnitude of runoff for each river. At the mouth stations an indication of turbidity is given for late spring and early summer as loss of light at 10 cm (1.0.1).

The density of aquatic invertebrate orders is given in Table 6 for the mouth stations and Table 7 for the riffle stations. These data are in the form of the mean number per square meter for three replicates at each sample time.

ACKNOWLEDGMENTS

The authors thank K. Donkersloot, G. Friesen, M. Haworth-Brockman, and L. Ross who assisted in the collection of samples and who perservered through sorting samples in the laboratory, Mrs. G. Decterow who typed the report and Mr. A. Wiens who reviewed the report and suggested improvements.

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Table 1. Description of sample stations for rivers in the 1982 Dauphin Lake Drainage Basin survey.

RIVER	STATION***	LOCATION LAT/LONG	ALTITUDE [M.A.S.L.]	DRAINAGE AREA [KM]^2	CHANNEL* MODIFIC.	SUBSTRATE**
TURTLE RIVER	MOUTH	51° 07′ N, 99° 38′ W	260	1375		
	D.S.	51° 03′ N, 99° 30′ W	260	1118	D,C	3
OCHRE RIVER	MOUTH	51° 07′ N, 99° 45′ W	260	453		
	D.S.	51° 04′ N, 99° 48′ W	270	348		4
	U.S.	50° 58′ N, 99° 48′ W	320	291		2.5
EDWARDS CREEK	MOUTH	51° 09′ N, 99° 51′ W	260	356		
	D.S.	51° 09′ N, 99° 54′ W	270	336	D,C	3
	U.S.	51° 02′ N, 100° 06′ W	360	114		2.5
VERMILION RIVER	MOUTH	51° 11′ N, 99° 51′ W	260	670		
	D.S.	51° 00′ N, 100° 02′ W	275	612	D	2.5
	U.S.	50° 59′ N, 100° 10′ W	390	302		3.5
WILSON RIVER	MOUTH	51° 13′ N, 99° 51′ W	260	946		
	D.S.	51° 12′ N, 100° 02′ W	275	881	C	3
	U.S.	51° 07′ N, 100° 29′ W	380	593		2.5
VALLEY RIVER	MOUTH	51° 22′ N, 99° 55′ W	260	2905		
	D.S.	51° 17′ N, 100° 02′ W	260	2870		3.5
	U.S.	51° 11′ N, 100° 51′ W	440	1720		4
MINK RIVER	MOUTH	51° 26′ N, 99° 58′ W	260	295		
	D.S.	51° 25′ N, 100° 02′ W	260	288	C	3
	U.S.	51° 25′ N, 100° 29′ W	390	115		3.5

* CHANNEL MODIFICATIONS
D= DAM ABOVE SAMPLE STATION
C= CHANNELIZATION AT OR NEAR SAMPLE STATION

** SUBSTRATE
1= SAND (a mixture of substrate types received intermediate values).
2= GRAVEL and/or SHALE
3= COBBLE
4= BOULDER

*** STATION
D.S.= DOWNSTREAM RIFFLE
U.S.= UPSTREAM RIFFLE

Table 2. Physical/chemical data from mouth stations in 1982 Dauphin Lake Drainage Basin survey.

RIVER	DATE	TIME	TEMP. [°C] AIR	WATER	%D.O.	pH	COND*	DEPTH [m]	L.O.L.** [10cm]	SUBSTRATE
TURTLE RIVER	MAY25	1700	26	18.5	76	7.6	610	2.4	560	SANDY OOZE
	JUNE22	1445	20	19	80	8.2	675	2.4	500	OOZE
	JULY27	1445	24	24.8	80	8.6	670	2	---	OOZE
	AUG23	1500	24	19.5	89	8.3	620	2	---	CLAY OOZE
OCHRE RIVER	MAY26	1950	26.5	23	95	8.3	550	0.8	220	SANDY SILT
	JUNE21	1815	18	20	108	8.4	400	0.8	150	SANDY SILT
	JULY27	1715	25	24	93	8.5	530	0.8	---	SANDY SILT
	AUG24	1230	19.5	18	97	8.4	503	1	---	SANDY CLAY
EDWARDS CREEK	MAY26	1840	27	24	133	8.7	680	0.8	260	SANDY SILT
	JUNE21	1710	23	23	120	8.4	420	1.25	450	SANDY SILT
	JULY26	1600	27	24	104	8.6	550	1.25	---	SANDY CLAY
	AUG24	1140	17.5	17	94	8.2	555	1	---	SANDY CLAY
VERMILION RIVER	MAY26	1730	27.5	23.5	211	8.9	520	1	1350	SILTY CLAY
	JUNE21	1600	23	23	107	8.3	400	0.5	1050	CLAY OOZE
	JULY26	1515	27	23	94	8.4	550	1.25	---	CLAY OOZE
	AUG24	1045	17.5	17	89	8.5	503	1.3	---	CLAY ORGANICS
WILSON RIVER	MAY22	1630	27.5	20.5	107	8.3	710	1.9	650	CLAY ORGANICS
	JUNE21	1445	23	23	94	8.4	340	1.5	65	CLAY ORGANICS
	JULY26	1440	27	27	115	8.6	520	1.5	---	CLAY OOZE
	AUG24	1015	17.5	17	95	8.7	500	1.5	---	CLAY ORGANICS
VALLEY RIVER	MAY25	1930	26	20.5	107	8.3	690	1.25	0	SHELL SAND
	JUNE22	1200	20	19	78	8.1	500	1.2	50	SHELL SAND
	JULY27	1045	24	23	78	8.4	650	1.2	---	SHELL SAND
	AUG23	1730	24	19	97	8.5	690	1.2	---	SHELL SAND
MINK RIVER	MAY26	850	16.5	18	89	8.3	930	1.75	190	SILT OOZE
	JUNE22	1030	20	18.5	83	8.2	425	1.7	40	SILT ORGANICS
	JULY27	1000	24	22.5	87	8.4	750	1.7	---	SILT ORGANICS
	AUG23	1650	24	19	99	8.3	580	1.7	---	CLAY ORGANICS

* CONDUCTIVITY (u seimens/cm)
** L.O.L. LOSS OF LIGHT (u EINSTEINS/m^2/sec)
BLANK SPACES INDICATE NO DATA AVAILABLE

Table 3. Physical/chemical data from riffle sample stations in 1982 Dauphin Lake Drainage Basin survey.

RIVER	STATION	DATE	TIME	TEMP. [°C] WATER	TEMP. [°C] AIR	%D.O.	pH	COND	DISCHARGE [m^3/s]	TSS [mg/L]
TURTLE RIVER	D.S.*	MAY 19	1330	9	11	90	8.1	460	10.2	384
		JUNE 24	1200	17	16	96	8.4	450	0.64	23
		JULY 28	1445	25	22	98	8.4	620	0.21	14
		AUG 25	1030	17	13	95	8.3	500	0.24	14
		SEPT 22	1430	13	21	90	8.3	525	0.16	6
OCHRE RIVER	D.S.	MAY 19	1330	9	10	91	8.1	440	4.5	240
		JUNE 21		18	19	107	8.7	420	0.74	25
		JULY 28	1600	25	21	107	8.5	540	0.17	26
		AUG 25	1200	14	12	93	8.2	505	0.2	24
		SEPT 22	1630	14	23	95	8.3	500	0.12	8
	U.S.**	MAY 27		22	26	118	8.6	500	4.5	---
		JUNE 21	1730	21	19	87	8.5	420	0.74	---
		JULY 28	1120	22	21	91	8.5	510	0.17	---
		AUG 24	1630	22	20	107	8.3	540	0.2	---
		SEPT 23	1000	12	9	89	8.4	450	0.12	---
EDWARDS CREEK	D.S.	MAY 18	1830	9	9	90	8.2	350	6.08	1690
		JUNE 24	900	15	13	91	8.3	410	0.25	32
		JULY 28	945	21	20	92	8.5	670	0.08	9
		AUG 23	1400	21	18	130	8.4	600	0.001	11
		SEPT 21	1350	16	24	116	8.4	1250	0.006	4
	U.S.	MAY 28	1030	11	11	99	8.7	550	0.136	---
		JUNE 24	1000	13	11	99	8.6	390	0.223	---
		JULY 29	1030	11	20	80	8.2	460	0.084	---
		AUG 25	930	12	9	96	8.3	530	0.034	---
		SEPT 24	920	5	2	95	8.2	525	0.019	---
VERMILION RIVER	D.S.	MAY 18	1700	10	11	88	8.2	370	2.52	46
		JUNE 23	1815	22	25	113	8.2	460	0.028	4
		JULY 26	1530	24	25	100	7.5	580	0	0
		AUG 23	1445	19	21	101	8.3	625	0.303	14
		SEPT 21	1530	17	25	85	8.2	650	0	0
	U.S.	JUNE 23	1630	21	26	98	8.4	450	---	---
		JULY 27	1700	24	20	105	7.2	660	---	---
		AUG 24	1400	17	17	108	8.1	660	---	---
		SEPT 24	1230	10	16	77	7.8	600	---	---
WILSON RIVER	D.S.	MAY 18	1330	11	11	88	8.2	540	0.561	4
		JUNE 23	1200	24	21	106	8.3	510	0.028	3
		JULY 27	1430	28	23	131	7.9	650	0.062	5
		AUG 23	1515	20	23	104	8.5	700	0.545	5
		SEPT 21	1445	18	24	121	8.4	600	0.005	3
	U.S.	MAY 27		18.5	22	108	8.4	---	---	---
		JUNE 22	1430	16	18	94	8.4	550	---	---
		JULY 27	1430	25	21	148	7.7	---	---	---

Table 3. continued

RIVER	STATION	DATE	TIME	TEMP. [°C] WATER	TEMP. [°C] AIR	%D.O.	pH	COND	DISCHARGE [m^3/s]	TSS [mg/L]
VALLEY RIVER	D.S.	MAY 18	1145	11	12	87	8.1	550	1.6	3
		JUNE 23	1000	23	21	105	8.3	550	0.3	4
		JULY 27	945	21	22	98	7.8	770	0.092	5
		AUG 24	1150	16	16	108	8.4	600	0.456	3
		SEPT 22	1030	12	17	75	8.3	510	0.026	2
	U.S.	JUNE 22	1615	21	20	99	8.3	500	0.182	----------
		JULY 27	1530	23	24	104	7.7	760	0.015	----------
		AUG 24	1150	16	16	94	8.2	560	0.04	----------
		SEPT 23	1645	14	17	99	8.3	580	0.003	----------
MINK RIVER	D.S.	MAY 18	1045	11	12	83	7.9	800	0.109	----------
		JUNE 22	1000	16	14	81	8.5	800	0.004	----------
		JULY 27	1030	22	23	105	8.1	830	0.013	----------
		AUG 23	1645	18	18	112	8.7	725	0.001	----------
		SEPT 22	930	10	11	80	8.4	810	0	----------
	U.S.	MAY 27	1030	18	21	90	8.3	1200	----------	----------
		JUNE 22	1130	16	16	7-	7.9	1200	----------	----------
		JULY 27	1215	20	27	89	8.2	1300	----------	----------
		AUG 24	1015	15	16	95	8	1400	----------	----------
		SEPT 23	1545	13	15	81	8.1	1260	----------	----------

* D.S.= DOWNSTREAM RIFFLE
** U.S.= UPSTREAM RIFFLE
BLANK SPACES INDICATE NO DATA AVAILABLE

Table 4. Major nutrient concentrations (ug/L) before and after spring run-off for rivers entering Dauphin Lake 1982.

RIVER	STATION	DATE	NH4-N	NO2-N	NO3-N	TDN	TDP	SUSP P	SUSP N	SUSP C
TURTLE	MOUTH	FEB 2	170	8	545	1190	136	56		
RIVER		MAY 25	10	1	1	560	14	17	42	220
	D.S.**	FEB 2	30	19	485	1380	138	106		
		MAY 3	120	2	90	1050	33	46	1	
OCHRE	MOUTH	MAY 25	10	1	3	500	8	16	63	960
RIVER	D.S.	FEB 25	800	32	585	3320	107	112		
		MAY 3	160	2	142	890	25	109	1	4650
	U.S.*	MAY 25	10	1	1	440	8	8	69	490
EDWARDS	MOUTH	MAY 25	30	1	2	500	9	18	31	1070
CREEK	D.S.	MAY 3	80	7	254	870	33	79	399	2680
	U.S.	MAY 25	30	1	4	350	6	5	23	430
VERMILION	MOUTH	FEB 25	900	2	13	1620	34	210		
RIVER		MAY 25	10	1	2	820	76	217	669	6350
	D.S.	FEB 25	170	1	6	380	22	15		
		MAY 5	1080	13	128	2220	345	344	992	5730
WILSON	MOUTH	FEB 25	380	4	94	1390	27	15		
RIVER		MAY 25	10	1	1	560	14	17	43	220
	D.S.	MAY 3	80	9	70	1160	50	48	399	2420
	U.S.	MAY 25	10	1	3	510	10	8	1138	21610
VALLEY	MOUTH	FEB 25	570	1	4	150	21	46		
RIVER		MAY 25	10	1	2	680	11	5	1115	
	D.S.	FEB 25	450	1	9	480	7	64		
		MAY 3	60	1	8	930	28	32	1053	2790
MINK	MOUTH	MAY 25	20	1	1	970	12	16	37	410
RIVER	D.S.	MAY 3	100	2	10	930	25	52	1	1
	U.S.	MAY 25	20	2	1	930	26	30	80	1700

* U.S. = UPSTREAM STATION
** D.S. = DOWNSTREAM STATION
BLANK SPACES INDICATE NO ANALYSIS

Table 5. Major elements (mg/L), dissolved inorganic carbon and dissolved organic carbon (u mole/L) of rivers entering Dauphin Lake before and after spring run-off 1982.

RIVER	STATION	DATE	Na	K	Ca	Mg	Fe	Mn	Cl	SO4	TSS	DIC	DOC
TURTLE	MOUTH	FEB 2	17.5	17.6	28	12.6	0.12	0.04	25	36.5	--	1540	3060
RIVER		MAY 25	27.1	5.95	63.8	28.2	0.04	0.01	30	87.5	19	3770	1710
	D.S.*	FEB 2	7.15	9.54	19.3	7.08	0.07	0.04	13	19	--	1110	2430
		MAY 3	16.2	6.39	43.6	21.8	0.14	0.03	16	56	30	2890	1290
OCHRE	MOUTH	MAY 25	11	3.11	57	14.7	0.04	0.01	3	54	10	3990	840
RIVER	D.S.	FEB 25	85.2	21	152	84.3	0.09	3.85	37.5	320	--	10230	1840
		MAY 3	6.17	3.7	47.9	19.1	0.18	0.03	2	28.8	140	3150	1070
	U.S.**	MAY 25	9.8	2.9	53.7	15.8	0.04	0.01	3	45	6	3870	710
EDWARDS	MOUTH	MAY 25	15.6	3.7	66.8	22.9	0.04	0.01	3	75	17	3560	780
CREEK	D.S.	MAY 3	13.4	4.38	55.6	19.4	0.11	0.04	4.5	68	94	3360	1040
	U.S.	MAY 25	13.3	2.7	72.1	21.8	0.09	0.25	4	70	5	3800	680
VERMILION	MOUTH	FEB 25	90	14.9	231	85.1	0.02	4.01	12.5	328	--	14950	2540
RIVER		MAY 25	31.6	6.46	47.7	12.2	0.04	0.03	8	85	39	3130	1010
	D.S.	FEB 25	51.9	8.01	135	40.6	0.02	2.36	7.5	248	--	7320	2460
		MAY 5	17.9	5.2	43.8	15.4	0.21	0.13	7.5	52	137	2640	1360
WILSON	MOUTH	FEB 25	59.6	11.5	93.4	51.4	0.02	1.07	32.5	183	--	6850	1840
RIVER		MAY 25	33	6.11	60.7	17.5	0.04	0.01	10	115	11	3840	950
	D.S.	MAY 3	16.7	6.23	47.6	18	0.21	0.01	4.5	62.5	27	2760	1640
	U.S.	MAY 25	39	5.16	65	22.7	0.04	0.04	3	78	4	4680	850
VALLEY	MOUTH	FEB 25	91.3	16.8	191	109	0.25	1.81	42.5	323	--	14700	2980
RIVER		MAY 25	31.6	6.82	69.8	31.3	0.04	0.01	15	125	1	4090	900
	D.S.	FEB 25	75.2	10.3	138	77.5	0.99	1.12	45	240	--	10390	1840
		MAY 3	21.7	8.58	54.6	27	0.04	0.01	24	106	13	3080	1440
MINK	MOUTH	MAY 25	49.7	10.2	99.1	32.3	0.04	0.01	15	300	6	4110	1390
RIVER	D.S.	MAY 3	42.4	10.4	90	44	0.07	0.03	15	254	69	3930	1530
	U.S.	MAY 25	59.5	5.91	123	35.2	0.04	0.03	10	370	15	6720	1300

* D.S.= DOWNSTREAM RIFFLE
** U.S.= UPSTREAM RIFFLE
BLANK SPACES INDICATE NO DATA AVAILABLE

Table 6. Density of organisms (mean #/m^2) in Ekman grab samples from mouth stations in 1982 Dauphin Lake Drainage Basin survey.

RIVER	DATE	EPHEM	TRICH	CHIR	COLEOP	AMPH	MOLL	OTHERS	TOTAL
TURTLE	MAY25	133.32	0.00	235.53	0.00	102.21	831.03	75.55	1377.64
RIVER	JUNE22	0.00	0.00	119.99	0.00	0.00	266.64	31.11	417.74
	JULY27	711.04	0.00	964.35	0.00	0.00	164.43	0.00	1839.82
	AUG23	1022.12	0.00	1079.89	14.67	0.00	88.88	2430.87	4636.43
OCHRE	MAY26	29.77	0.00	457.73	75.55	0.00	177.76	208.87	949.68
RIVER	JUNE21	0.00	13.33	8652.47	14.67	0.00	742.15	0.00	9422.61
	JULY27	222.20	75.55	5910.52	0.00	0.00	666.60	1257.65	8132.52
	AUG24	75.55	75.55	1346.53	0.00	0.00	502.17	679.93	2679.73
EDWARDS	MAY26	0.00	0.00	102.21	13.33	0.00	119.99	133.32	368.85
CREEK	JUNE21	0.00	0.00	5688.32	0.00	0.00	75.55	0.00	5763.87
	JULY26	75.55	0.00	5035.05	0.00	0.00	75.55	0.00	5186.15
	AUG24	119.99	0.00	2399.76	0.00	0.00	475.51	0.00	2995.26
VERMILION	MAY26	75.55	0.00	279.97	0.00	0.00	1942.03	57.77	2355.32
RIVER	JUNE21	0.00	0.00	75.55	0.00	0.00	208.87	0.00	284.42
	JULY26	133.32	0.00	2546.41	13.33	0.00	399.96	2830.83	5923.85
	AUG24	13.33	13.33	44.44	13.33	0.00	1364.31	9763.47	11212.21
WILSON	MAY22	75.55	0.00	1111.00	0.00	0.00	844.36	13.33	2044.24
RIVER	JUNE21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	JULY26	75.55	13.33	2635.29	0.00	0.00	146.65	208.87	3079.69
	AUG24	13.33	0.00	4075.15	133.32	0.00	13.33	1346.53	5581.66
VALLEY	MAY25	0.00	0.00	355.52	0.00	0.00	4119.59	0.00	4475.11
RIVER	JUNE22	75.55	0.00	3244.12	0.00	0.00	10087.88	0.00	13407.55
	JULY27	0.00	13.33	933.24	0.00	0.00	8830.23	13.33	9790.13
	AUG23	431.07	13.33	2430.87	0.00	0.00	14665.20	297.75	17838.22
MINK	MAY26	0.00	44.44	1155.44	0.00	0.00	2608.63	679.93	4488.44
RIVER	JUNE22	0.00	44.44	3008.59	13.33	13.33	3479.65	0.00	6559.34
	JULY27	0.00	13.33	2519.75	0.00	0.00	1319.87	0.00	3852.95
	AUG23	0.00	0.00	208.87	164.43	0.00	222.20	1302.09	1897.59

Table 7. Density of organisms (mean #/m^2) in Surber samples from riffle stations in 1982 Dauphin Lake Drainage Basin survey.

RIVER	STATION	DATE	PLEC	EPHEM	TRICH	CHIR	SIMUL	COLEOP	AMPH	MOLL	OTHERS	TOTAL
TURTLE RIVER	D.S.*	MAY 19	0.00	0.00	0.00	43.04	89.31	24.75	0.00	0.00	3.55	160.65
		JUNE 2	3.55	175.39	67.79	13901.92	147.41	67.79	0.00	29.05	64.56	14457.46
		JULY 2	10.76	670.35	239.95	2152.00	125.89	29.05	0.00	0.00	0.00	3228.00
		AUG 25	7.10	265.77	1100.75	602.56	0.00	93.61	0.00	75.32	10.76	2155.87
		SEPT 2	3.55	32.28	1345.00	530.47	0.00	129.12	0.00	258.24	7.10	2305.76
OCHRE RIVER	D.S.	MAY 19	0.00	7.10	7.10	989.92	13.99	13.99	0.00	23.35	218.43	1273.88
		JUNE 2	0.00	24.75	0.00	215.20	247.48	0.00	0.00	0.00	35.51	522.94
		JULY 2	13.99	405.65	298.05	850.04	0.00	39.81	0.00	7.21	29.05	1643.81
		AUG 25	32.28	29.05	341.09	29.05	0.00	13.99	0.00	3.55	0.00	449.01
		SEPT 2	132.35	78.55	2510.31	239.95	0.00	72.09	0.00	3.55	32.28	3069.07
	U.S.**	MAY 27	7.21	7.21	0.00	64.56	0.00	3.55	0.00	0.00	18.29	100.82
		JUNE 2	10.76	158.17	3.55	293.75	1944.33	7.10	0.00	0.00	0.00	2417.66
		JULY 2	21.52	172.16	189.38	398.12	121.59	0.00	0.00	0.00	13.99	916.75
		AUG 24	53.80	193.68	1137.33	255.01	116.21	3.55	0.00	0.00	10.76	1770.34
		SEPT 2	211.97	161.40	7076.85	64.56	3.55	3.55	0.00	0.00	7.10	7528.99
EDWARDS CREEK	D.S.	MAY 18	0.00	3.55	7.10	189.38	35.51	24.75	0.00	0.00	0.00	260.28
		JUNE 2	32.28	115.13	0.00	1527.92	0.00	3.55	0.00	0.00	29.05	1707.93
		JULY 2	0.00	301.28	118.36	487.43	293.75	21.52	0.00	0.00	3.55	1225.89
		AUG 23	0.00	2256.37	846.81	373.37	0.00	21.52	3.55	7.21	10.76	3519.60
		SEPT 2	0.00	2722.28	233.49	336.79	0.00	21.52	21.52	32.28	10.76	3378.64
	U.S.	MAY 28	46.27	121.59	121.59	100.07	24.75	10.76	0.00	0.00	3.55	428.57
		JUNE 2	64.56	18.29	46.27	301.28	301.28	7.21	0.00	3.55	18.29	760.73
		JULY 2	0.00	172.16	29.05	107.60	3.55	7.21	0.00	3.55	10.76	333.88
		AUG 25	13.99	121.59	218.43	61.33	0.00	3.55	0.00	0.00	18.29	437.18
		SEPT 2	129.12	139.88	1018.97	3554.03	13.99	29.05	0.00	7.21	29.05	4921.30
VERMILION RIVER	D.S.	MAY 18	0.00	0.00	0.00	17.22	29.05	0.00	0.00	3.55	13.99	63.81
		JUNE 2	7.21	670.35	0.00	983.46	34948.48	18.29	0.00	3.55	61.33	36692.68
		JULY 2	3.55	473.44	36.08	556.29	164.63	13.99	0.00	39.81	57.03	1394.82
		AUG 23	0.00	319.57	322.80	347.55	7.21	7.21	0.00	29.05	21.52	1054.91
		SEPT 2	10.76	677.88	1926.04	1818.44	3.55	10.76	0.00	82.85	49.50	4579.78
	U.S.	JUNE 2	0.00	239.95	3.55	43.04	10.76	7.10	0.00	0.00	0.00	304.40
		JULY 2	10.76	46.27	39.81	1331.01	0.00	21.52	0.00	0.00	0.00	1449.37
		AUG 24	7.10	322.80	1617.23	369.07	0.00	67.79	0.00	3.55	136.65	2524.19
		SEPT 2	21.52	229.19	1283.67	196.91	0.00	100.07	0.00	21.52	293.75	2146.62
WILSON RIVER	D.S.	MAY 18	0.00	0.00	0.00	129.12	8422.93	0.00	0.00	3.55	0.00	8555.60
		JUNE 2	50.57	121.59	24.75	1148.09	24.75	0.00	46.91	121.59	24.75	1563.00
		JULY 2	0.00	32.28	7.21	121.59	7.21	0.00	39.81	0.00	39.81	247.91
		AUG 23	0.00	1355.76	524.01	1008.21	211.97	7.21	1581.72	57.03	64.56	4810.47
		SEPT 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	U.S.	MAY 27	0.00	46.27	7.21	1646.28	427.17	64.56	0.00	0.00	7.21	2198.70
		JUNE 2	32.28	255.01	3.55	64.56	0.00	0.00	3.23	0.00	0.00	358.63
		JULY 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 7. continued.

RIVER	STATION	DATE	PLEC	EPHEM	TRICH	CHIR	SIMUL	COLEOP	AMPH	MOLL	OTHERS	TOTAL
VALLEY RIVER	D.S.	MAY 18	0.00	57.03	67.79	842.51	14899.37	193.68	7.21	53.80	21.52	16142.91
		JUNE 2	10.76	1008.21	64.56	415.34	3776.76	43.04	0.00	24.75	93.61	5437.03
		JULY 2	10.76	265.77	29.05	505.72	18.29	78.55	32.28	13.99	7.21	961.62
		AUG 24	72.09	451.92	527.24	484.20	0.00	373.37	196.91	0.00	10.76	2116.49
		SEPT 2	164.63	1606.47	1065.24	358.31	0.00	1180.37	86.08	89.31	57.03	4607.43
	U.S.	JUNE 2	3.55	46.27	29.05	3501.30	0.00	261.47	0.00	39.81	29.05	3910.51
		JULY 2	18.29	93.61	322.80	850.04	0.00	158.17	0.00	24.75	0.00	1467.66
		AUG 24	24.75	573.51	2407.01	3443.20	0.00	534.77	0.00	150.64	50.57	7184.45
		SEPT 2	89.31	541.23	1804.45	1008.21	0.00	842.51	0.00	319.57	129.12	4734.40
MINK RIVER	D.S.	MAY 18	0.00	7.21	7.10	301.28	1495.64	0.00	3.55	13.99	13.99	1842.76
		JUNE 2	0.00	10.76	0.00	1844.26	21.52	89.31	3.55	0.00	0.00	1969.40
		JULY 2	0.00	355.08	46.27	659.59	7532.00	7.21	451.92	39.81	35.51	9127.39
		AUG 23	0.00	538.00	29.05	16.14	1027.58	16.14	3400.16	220.58	16.14	5263.79
		SEPT 2	0.00	282.99	82.85	35.51	713.39	3.55	767.19	215.20	24.75	2125.42
	U.S.	MAY 27	18.29	355.08	1719.45	1685.02	7.21	279.76	0.00	433.63	82.85	4581.29
		JUNE 2	0.00	914.60	1928.19	6786.01	182.92	1255.69	50.57	1119.04	0.00	12237.03
		JULY 2	7.21	308.81	2853.55	562.75	39.81	222.73	0.00	143.11	0.00	4137.97
		AUG 24	7.21	207.67	11711.18	1786.16	10.76	1094.29	46.27	172.16	136.65	15172.35
		SEPT 2	86.08	344.32	12604.26	591.80	7.21	1520.39	0.00	498.19	118.36	15770.61

* D.S.= DOWNSTREAM RIFFLE
** U.S.= UPSTREAM RIFFLE

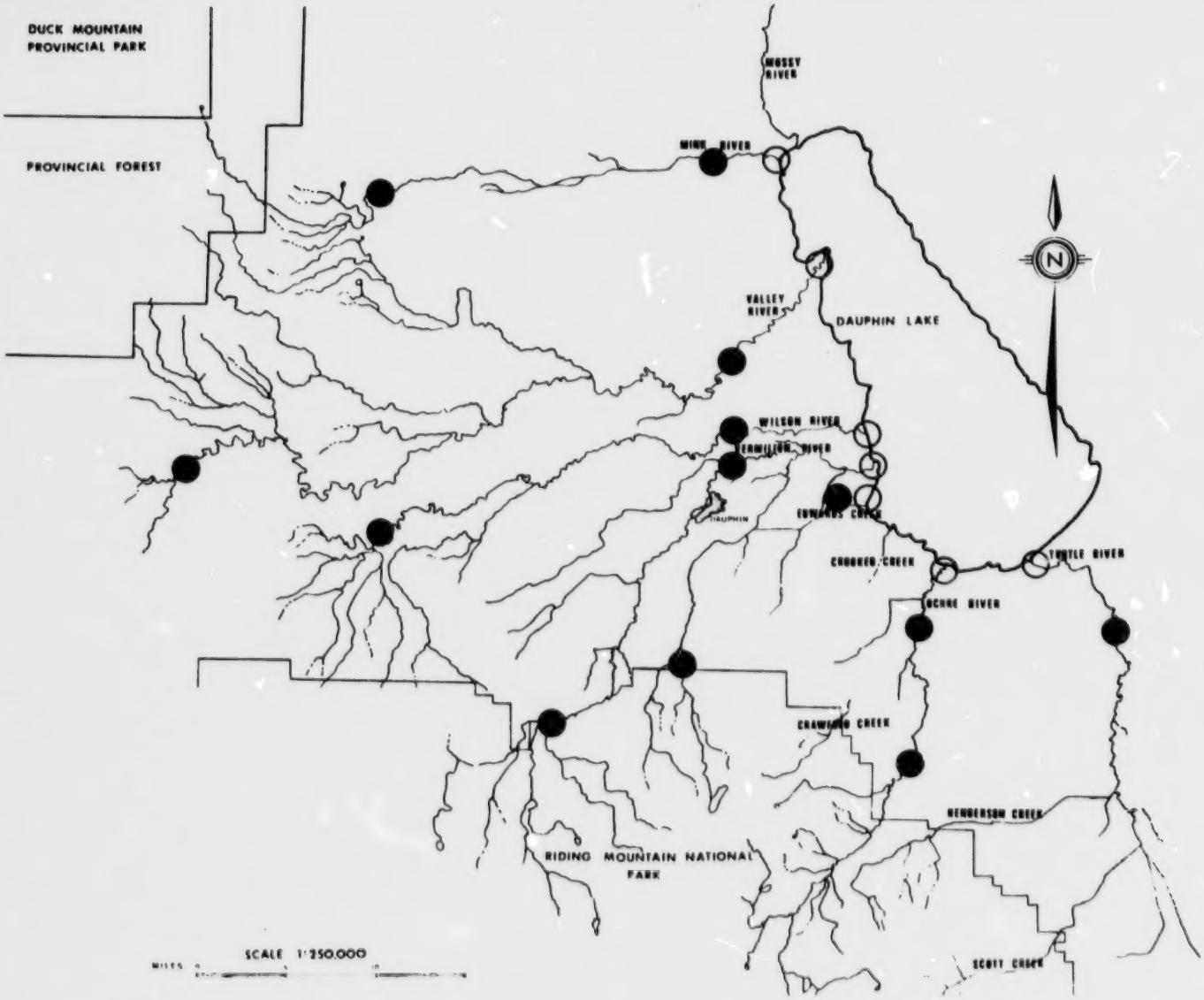
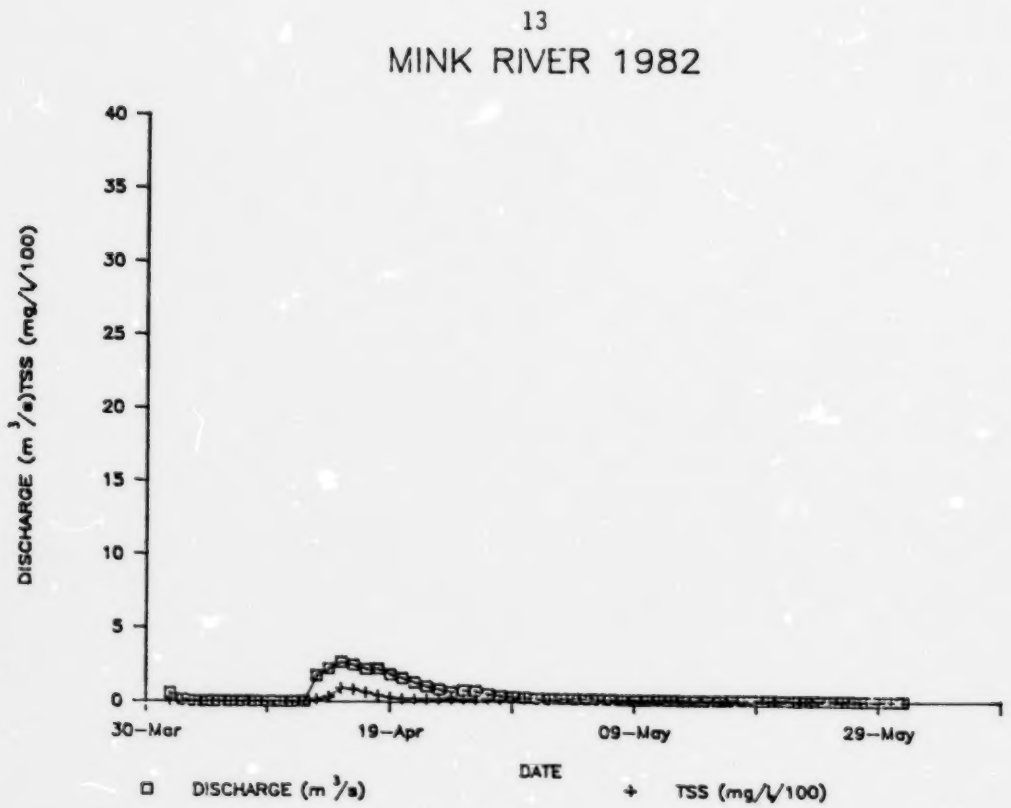


Fig. 1. Map of Dauphin Lake Drainage Basin showing sample stations (open circles = mouth stations, closed circles = riffle stations).



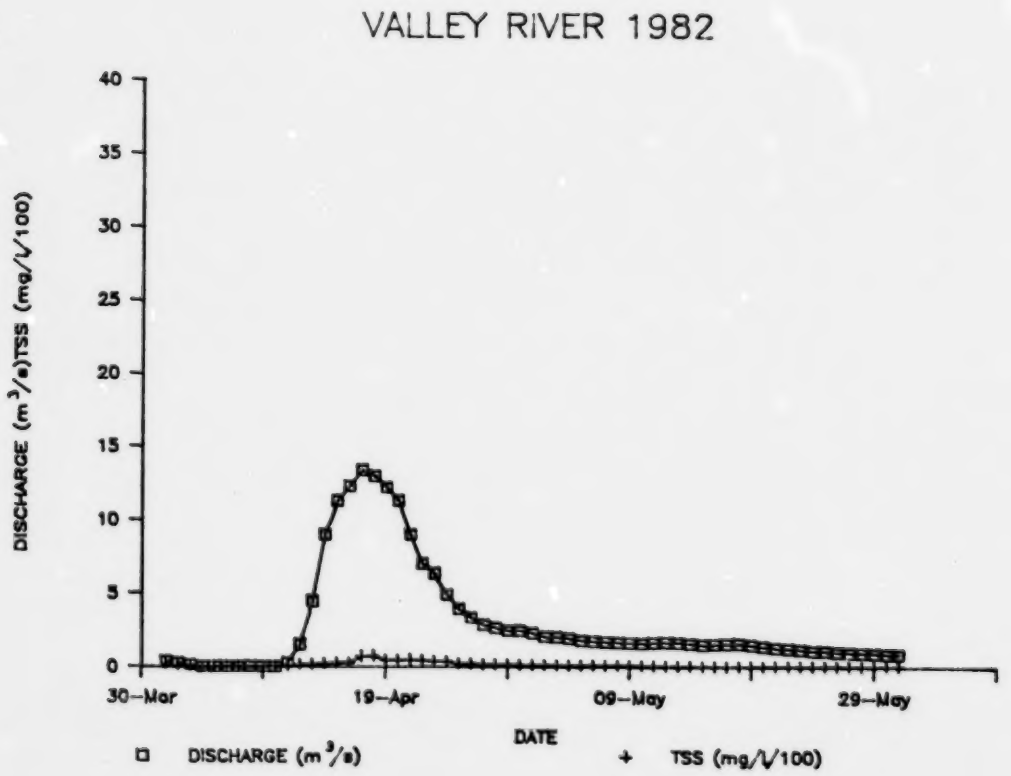
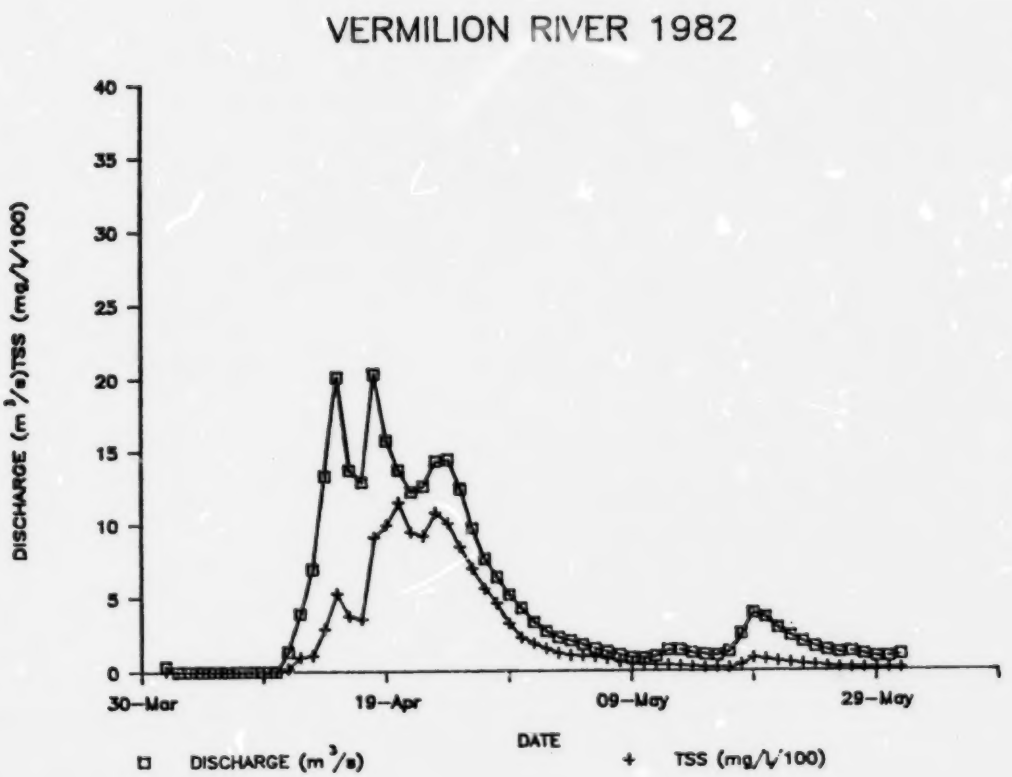


Fig. 2. Discharge (m^3/s) and total suspended solids ($mg/L^1/100$) Mink River and Valley River April and May 1982.



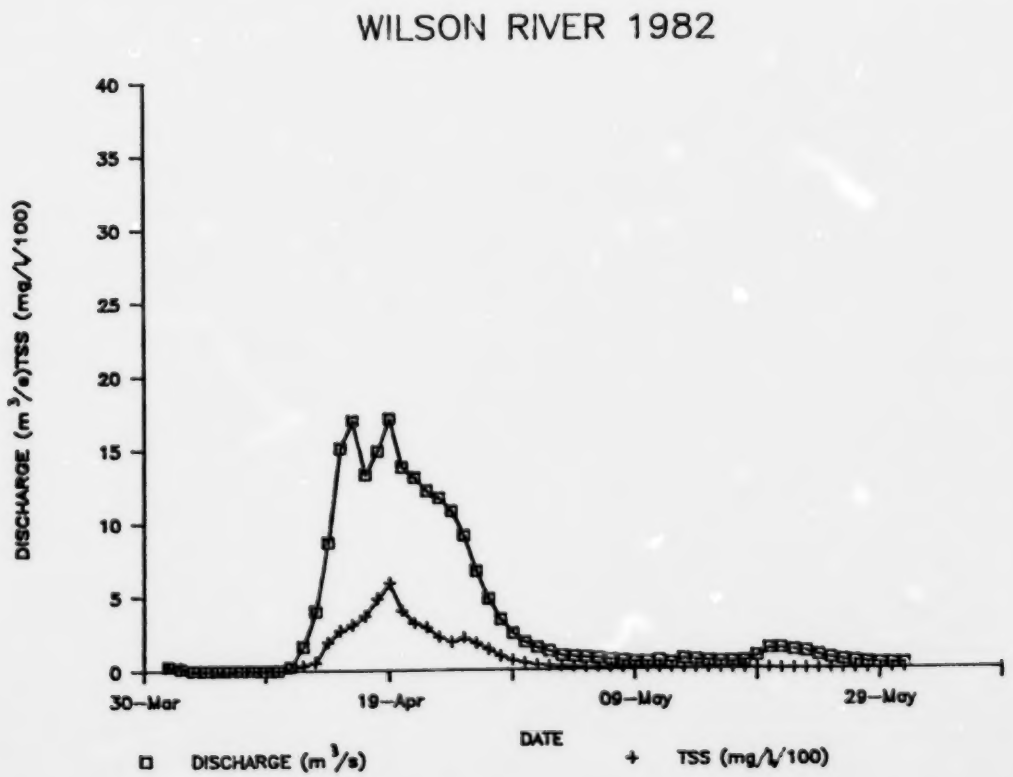


Fig. 3. Discharge (m^3/s) and total suspended solids (mg/L^1/100) Vermillion River and Wilson River April and May 1982.

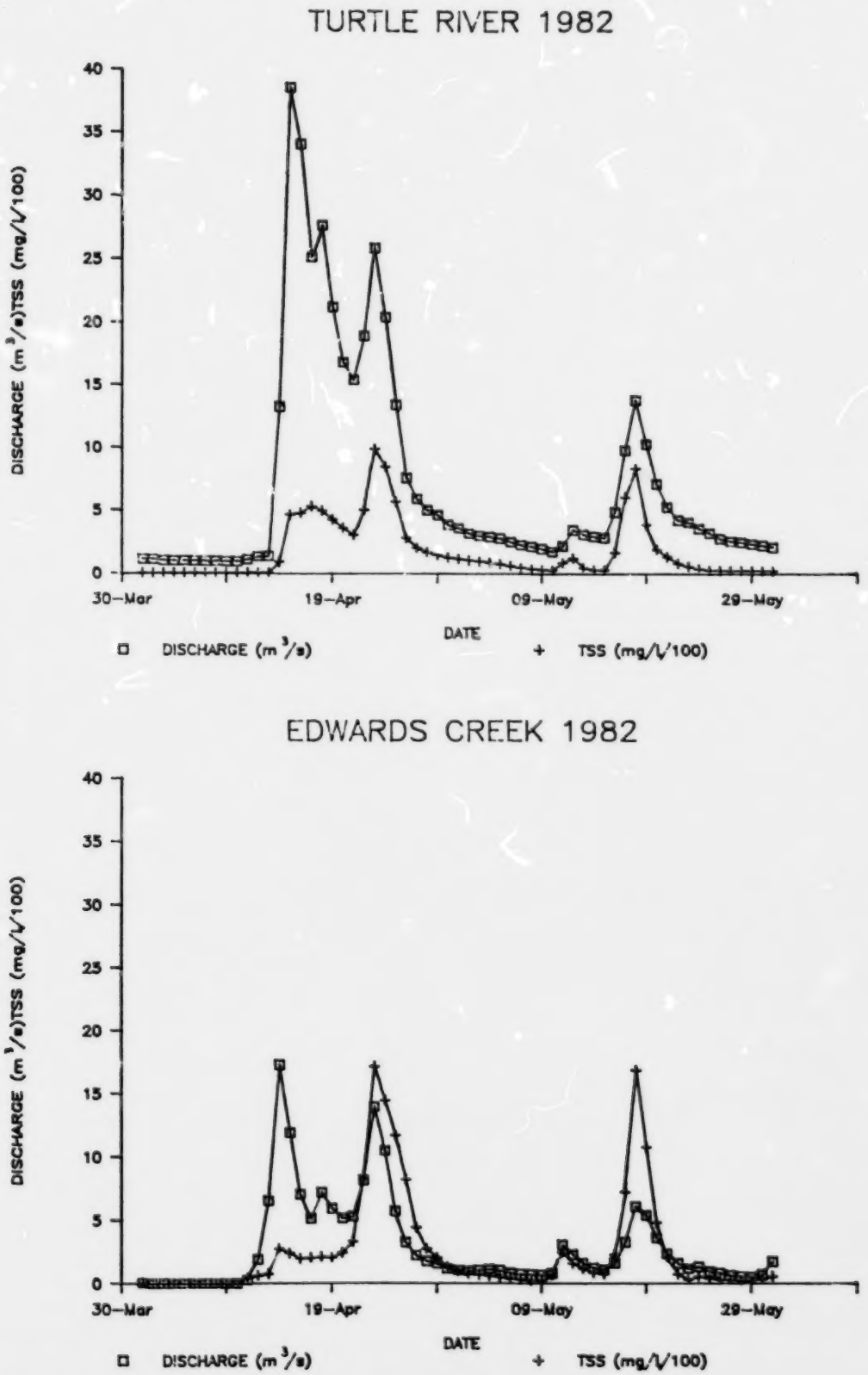


Fig. 4. Discharge (m^3/s) and total suspended solids ($mg/L^1/100$) Turtle River and Edwards Creek April and May 1982.

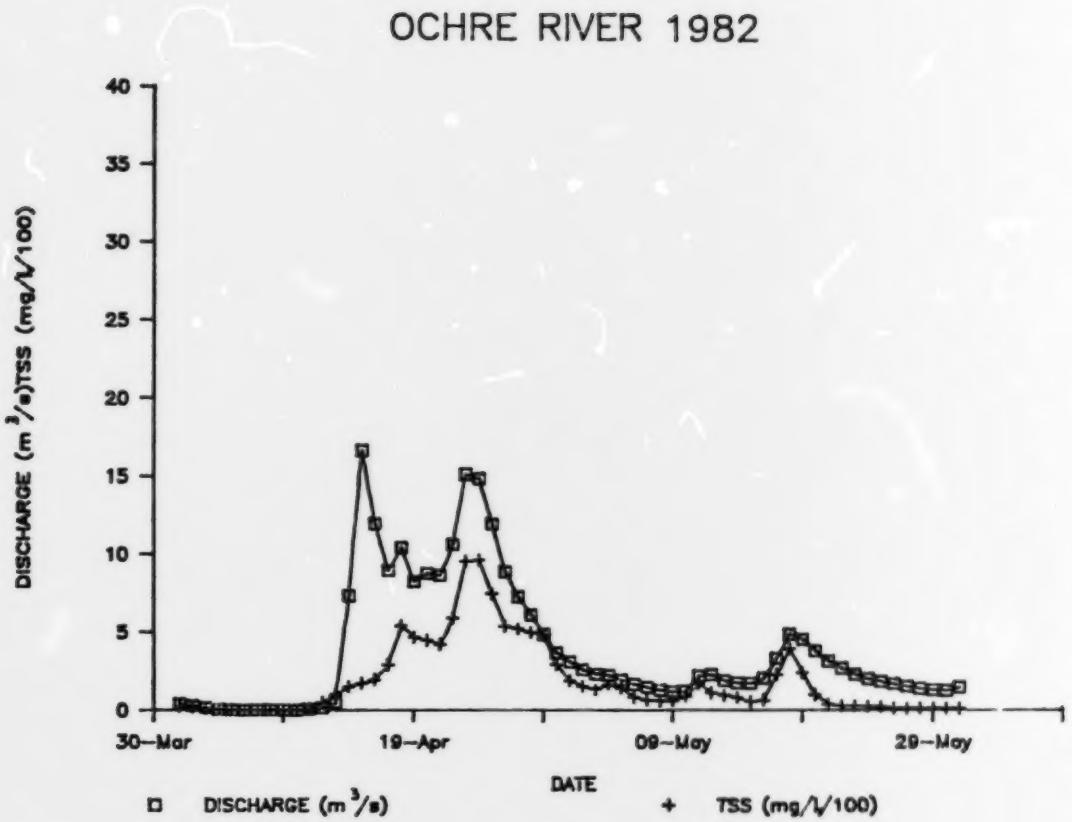


Fig. 5. Discharge (m^3/s) and total suspended solids ($mg/L^1/100$) Ochre River April and May 1982.